

We claim:

1. A circuit for coupling a power source to a load, comprising:

a main contactor coupled in series with the power source and the load; and

5 a detector circuit coupled to a conductive path, the conductive path in parallel with the main contactor, the detector circuit configured to detect the flow of current through the conductive path.

2. The circuit of claim 1, further comprising a controller circuit coupled to the

10 main contactor and to the detector circuit, the controller circuit operative to receive a signal from the detector circuit indicative of the charge condition of the load, the controller circuit comprising

main contactor control means for controlling the state of the main contactor.

15 3. The circuit of claim 2, wherein the main contactor control means ensures that the main contactor remains open after the detector circuit detects an unintentional opening of the main contactor.

4. The circuit of claim 3, wherein the main contactor control means ensures the
20 main contactor remains open for a predetermined period of time.

5. The circuit of claim 3, wherein the main contactor control means ensures the main contactor remains open until the controller circuit is manually reset.

6. The circuit of claim 1, wherein the detector circuit comprises a current sensing element.

7. The circuit of claim 6, wherein the current sensing element senses the current through a current limiting element coupled in the conductive path.

8. The circuit of claim 1, further comprising a controller circuit coupled to the main contactor and to the detector circuit, the controller circuit operative to receive a signal from the detector circuit indicative of the charge condition of the load, the controller circuit operative to control the state of the main contactor.

9. The circuit of claim 8, wherein the controller circuit comprises main contactor control means for causing the main contactor to close when the current detected by the detector circuit is less than or equal to a predetermined value.

10. The circuit of claim 8, wherein the controller circuit comprises main contactor control means for causing the main contactor to open when the current detected by the detector circuit is greater than a predetermined value.

11. A circuit for coupling a power source to a load, comprising:
a main contactor coupled in series with the power source and the load, the main contactor operable in a conductive state and a non-conductive state;
a pre-charge circuit coupled in parallel with the main contactor, the pre-charge circuit outputting a signal indicative of the current passing through the pre-charge circuit; and

a controller circuit coupled to the main contactor and to the pre-charge circuit and operative to control the state of the main contactor based on the signal from the pre-charge circuit.

5 12. The circuit of claim 11, wherein the pre-charge circuit comprises a resistive element for determining the current through the pre-charge circuit.

13. The circuit of claim 12, further comprising a controllable switch in series with the resistive element.

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14. The circuit of claim 13, wherein the controller circuit is coupled to the controllable switch and is operative to control the state of the controllable switch.

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15. The circuit of claim 11, wherein the controller circuit comprises main contactor control means for causing the main contactor to close when the current through the pre-charge circuit is less than or equal to a predetermined value.

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16. The circuit of claim 11, wherein the controller circuit comprises main contactor control means for causing the main contactor to open when the current through the pre-charge circuit is greater than a predetermined value.

17. A circuit for coupling a power source to a load, comprising:
a main contactor coupled in series with the power source and the load;

a pre-charge circuit comprising a first conductive path coupled in parallel with the main contactor,

a discharge circuit comprising a second conductive path coupled in parallel with the load; and

5 a controller circuit coupled to the main contactor and to the pre-charge circuit, the controller circuit operative to control the opening of the main contactor based on a current through the first conductive path.

10 18. The circuit of claim 17, further comprising a controllable element in series with the second path, the controllable element capable of selectively making the second path non-conductive.

15 19. The circuit of claim 18, wherein the controller circuit controls the state of the controllable element.

20 20. The circuit of claim 17, wherein the controller circuit comprises main contactor controller means for causing the main contactor to close when a voltage drop across a current limiting element in series with the first conductive path is less than or equal to a predetermined value.

25 21. The circuit of claim 17, wherein the controller circuit comprises main contactor control means for causing the main contactor to open when a voltage drop across a current limiting element in series with the first conductive path is greater than a predetermined value.

22. The circuit of claim 17, wherein the second conductive path provides a discharge path to discharge the load when the main contactor is open.

23. A power system, comprising:

5 a power source,
a load,
a main contactor coupled in series with the power source and the load; and
a detector circuit coupled to a conductive path, the conductive path in parallel with
the main contactor, the detector circuit configured to detect the flow of current through the
10 conductive path.

24. The power system of claim 23, wherein the power source is selected one of a battery, a supercapacitor, a fuel cell, and a rectified AC source.

15 25. The power system of claim 23, wherein the load comprises a capacitive stage.

26. A circuit for coupling a power source to a load, comprising:

a main contactor coupled in series with the power source and the load; and
a detector circuit coupled to a conductive path in parallel with the main contactor, the
20 detector circuit configured to detect an unintentional opening of the main contactor